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Indian Standard

(Reaffirmed 2006)

SPECIFICATION FOR SHORT PITCH TRANSMISSION PRECISION BUSH CHAINS AND CHAIN WHEELS

(First Revision)

Transmission Devices Sectional Committee, EDC 44; Chains and Sprockets Subcommittee, EDC 44 : 5 [Ref : Doc : EDC 44 (3323)]

1. Scope — Covers the dimensions, tolerances, measuring loads and minimum breaking loads of short pitch precision bush chains of simple and multiplex construction suitable for the mechanical transmission of power and allied applications, together with the tooth gap forms and rim profiles of their associated chain wheels. It includes chains of two pitches only, namely, 6·35 mm and 9·525 mm and applies primarily to chain wheels of teeth from 9 to 150 (inclusive).

SECTION 1 CHAINS

2. Nomenclature — For the purpose of this standard, the nomenclature given in Fig. 1 shall apply.

3. Dimensions — Shall be as given in Table 1.

3.1 *Attachments* — Standard attachments for use with 06 C size chain shall conform to Tables 2, 3 and 4.

4. Mechanical Properties of Chains

4.1 *Breaking Loads* — For the purpose of this test, the test length shall have a minimum of five free pitches. The ends shall be attached to the testing machine shackles by a pin through the plate holes or through the bushes or by the bush common to an inner and outer link; the actual method to be used is left to the discretion of the manufacturer. The shackles shall be so designed as to allow universal movement. The tests shall be disregarded when failures occur adjacent to the shackles.

4.1.1 The minimum tensile breaking loads shall be as given in Table 1.

4.2 *Proof-Loading* — All chains shall be proof-loaded to one-third of the minimum tensile breaking load given in Table 1.

4.3 *Length Accuracy* — Finished chains shall be measured after proof-loading but before lubricating.

4.3.1 The standard length for measurement shall be 49 times the pitch of the chain and shall terminate at each end in an inner link.

4.3.2 The chain shall be supported throughout its entire length and the measuring load given in Table 1 shall be applied.

4.3.3 The tolerance on the nominal length shall be ${}^{+0{\cdot}15}_{\;\;0}$ percent.

4 3.3.1 The length accuracy of chains which have to work in parallel shall be within the above limit, but matched by agreement with the manufacturer.

5. Designation — Chains shall be designated by the chain number given in Table 1 supplemented by a hyphenated suffix (1 for simple chain, 2 for duplex chain, 3 for triplex chain) and number of this standard.

Example:

A chain of number 04 C and duplex construction shall be designated as:

Chain 04 C — 2 IS : 3560

6. Marking — Chains shall be marked with:

a) manufacturer's name or trade-mark, and
b) chain number.

6.1 *ISI Certification Marking* — Details available with the Indian Standards Institution.

7. Packing — All chains shall be suitably packed and lubricated to ensure protection during transit and storing.

Adopted 18 April 1980

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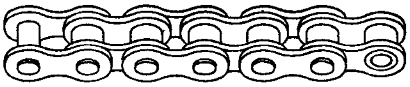
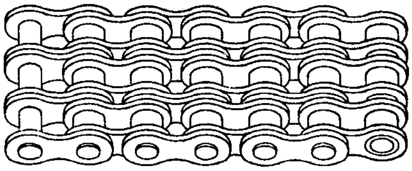
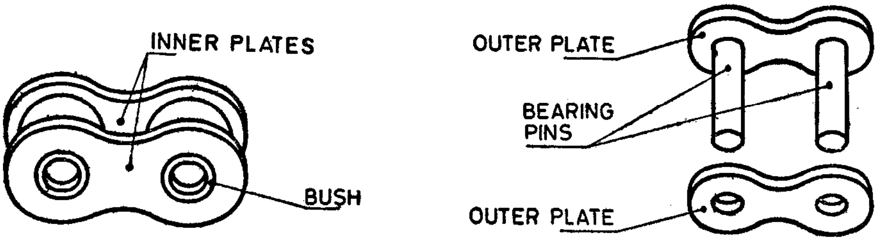


BUSH CHAIN, SINGLE

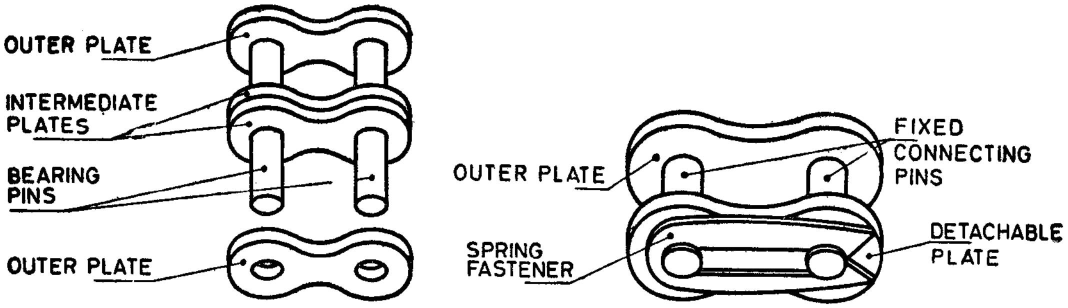


BUSH CHAIN, MULTIPLE (TRIPLEX)



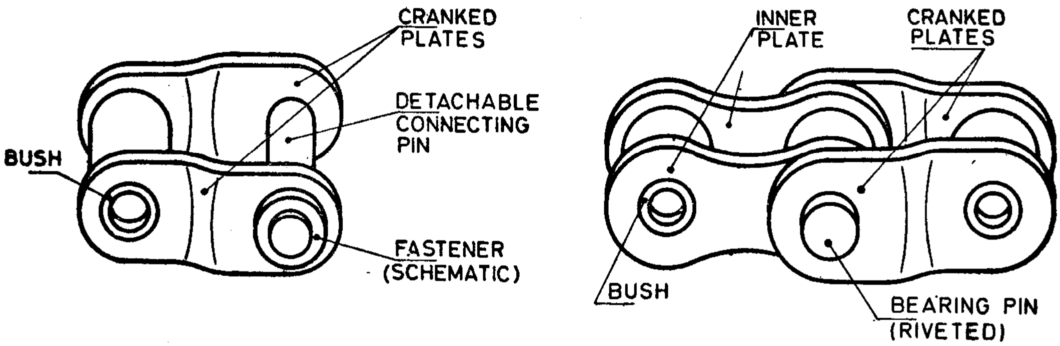
INNER LINK

OUTER LINK, SIMPLE



OUTER LINK, DUPLEX

CONNECTING LINK WITH SPRING FASTENER



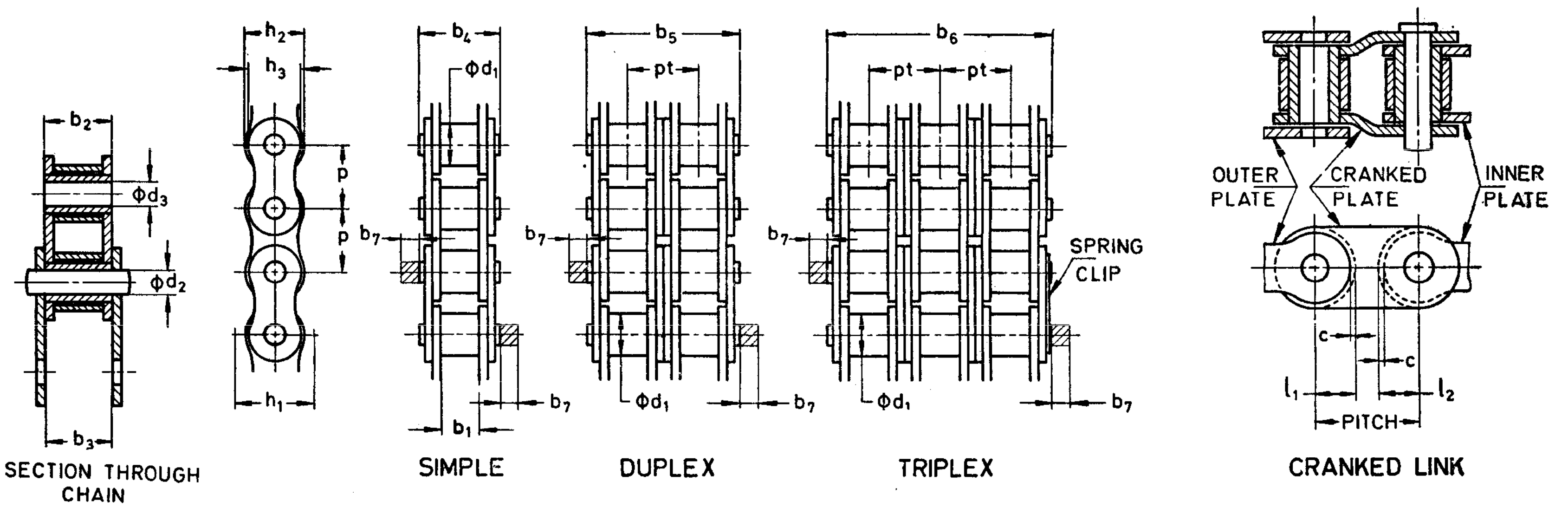
CRANKED LINK, SINGLE

CRANKED LINK, DOUBLE

FIG. 1 TYPES OF BUSH CHAINS AND LINKS

TABLE 1 DIMENSIONS, MEASURING LOADS AND BREAKING LOADS FOR CHAINS

(*Clauses* 3, 4.1.1, 4.2, 4.3.2, 5 *and* 8)



SECTION THROUGH CHAIN SIMPLE DUPLEX TRIPLEX CRANKED LINK

Chain Number	Pitch	Bush Diameter	Width Between Inner Plates	Bearing Pin Body Diameter	Bush Bore	Chain Path Depth	Inner Plate Depth	Outer/Intermediate Plate Depth	Cranked Link Dimensions*			Transverse Pitch	Width Over Inner Link	Width Between Outer Plates	Width Over Bearing Pins			Additional Width for Joint Fastener	Measuring Load			Breaking Load		
															Simple	Duplex	Triplex		Simple	Duplex	Triplex	Simple	Duplex	Triplex
	p	d_1 Max	b_1 Min	d_2 Max	d_3 Min	h_1 Min	h_2 Max	h_3 Max	l_1 Min	l_2 Min	c	p_t	b_2 Max	b_3 Min	b_4 Max	b_5 Max	b_6 Max	b_7 Max				Min	Min	Min
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kN	kN	kN	kN	kN	kN
04 C	6·35	3·30	3·18	2·311	2·34	6·27	6·02	5·21	2·64	3·06	0·08	6·40	4·80	4·93	9·1	15·5	21·8	2·5	5	10	15	350	700	1 050
06 C	9·525	5·08	4·77	3·580	3·63	9·30	9·05	7·80	3·96	4·60	0·08	10·13	7·47	7·60	13·2	23·4	33·5	3·3	7	14	21	790	1 580	2 370
COMMONLY USED PRECISION BUSH CHAINS																								
—	9·525	5·00	7·50	3·57	3·61	10·25	10·00	10·00	—	—	—	—	11·20	11·33	16·6	—	—	0·9	7	—	—	1 200	—	—
—	9·525	6·00	9·52	4·45	4·49	10·25	10·00	10·00	—	—	—	—	13·30	13·43	17·6	—	—	1·7	7	—	—	1 200	—	—

Note 1 — Dimension *c* represents the clearance between the cranked link plates and the straight plates available during articulation.

Note 2 — The chain path depth h_1 is the minimum depth of channel through which the assembled chains should be able to pass.

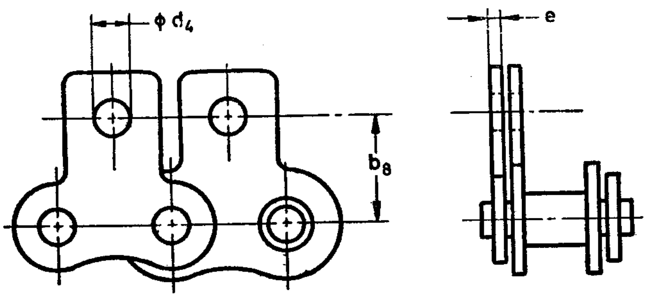
Note 3 — The overall width of a chain with a joint fastener is equal to the width over the bearing pins b_4, b_5, or b_6 plus b_7, for riveted pins (or plus 1·6 b_7 for headed pins end) if fastener is on one side only, or plus 2 b_7, if fastener is on both sides. The width over bearing pins for chains wider than triplex $= b_4 + P_t$ (number of strands in chain — 1).

*Cranked links are not recommended for use on chains which are intended for onerous applications.

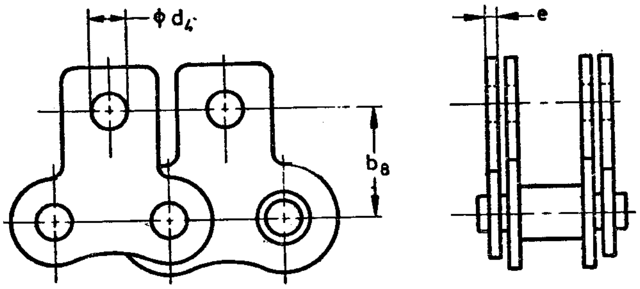
TABLE 2 DIMENSIONS OF STRAIGHT LINK PLATE EXTENSION

(*Clause* 3.1)

All dimensions in millimetres.



Extension One Side of Chain



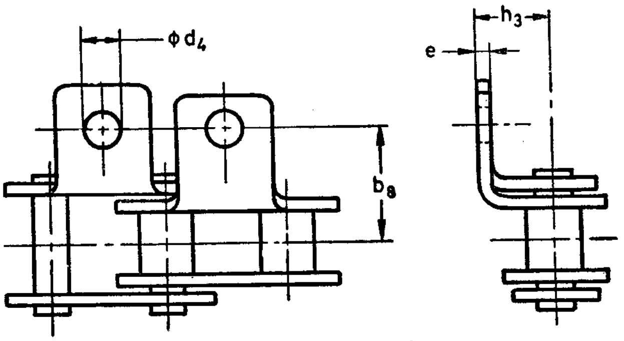
Extension Both Sides of Chain

Chain Number	d_4 *Min*	b_8	*e*
06 C	2·59	9·53	1·27

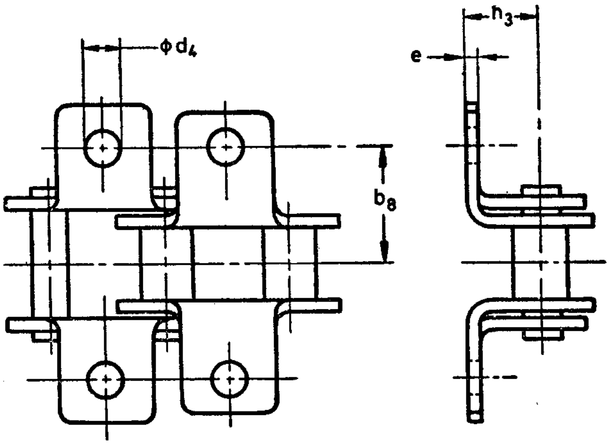
TABLE 3 DIMENSIONS OF BENT LINK PLATE EXTENSION

(*Clause* 3.1)

All dimensions in millimetres.



Extension One Side of Chain



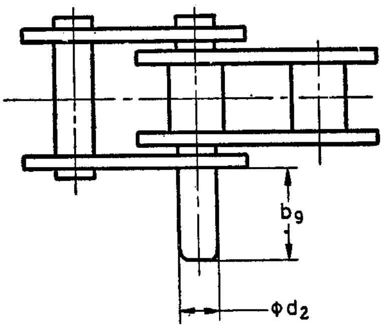
Extension Both Sides of Chain

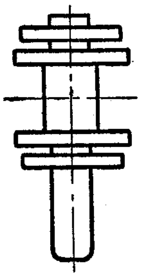
Chain Number	d_4 *Min*	h_3	b_8	
06 C	2·59	6·35	9·53	1·27

TABLE 4 DIMENSIONS OF EXTENDED PIN

(*Clause* 3.1)

All dimensions in millimetres.



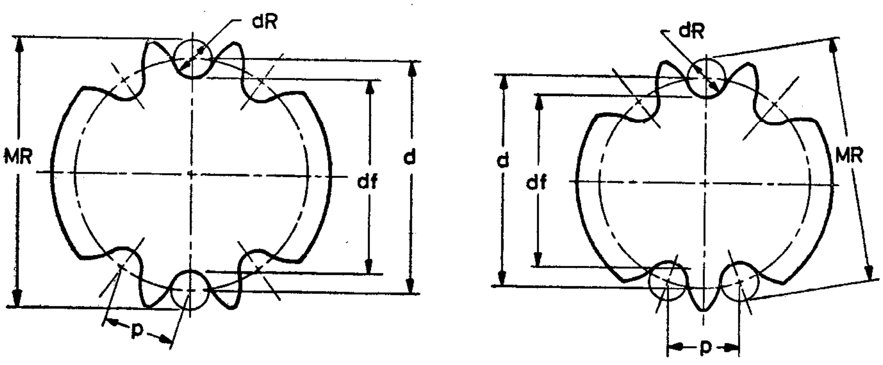


Chain Number	d_3	b_9
06 C	3·58	9·53

SECTION 2 CHAIN WHEELS

8. Nomenclature — The nomenclature for basic chain dimensions on which all wheel data are based shall be found in Table 1. Chain wheel nomenclature is covered under the respective headings.

9. Diametral Dimensions of Wheel Rim — *See* Fig. 2.



p = chordal pitch and is equal to chain pitch = $\dfrac{p}{\text{Sin}\,\dfrac{180^\circ}{z}}$

dR = measuring pin diameter

z = number of teeth

d = pitch circle diameter

df = root diameter

MR = measurement over pins

d_1 = bush diameter, maximum (*see* Fig. 3)

FIG. 2 DIAMETRAL DIMENSIONS OF WHEEL RIMS

9.1 *Measurement Over Pins*

9.1.1 The measurement over pins of wheels with even numbers of teeth should be carried out over pins inserted in opposite tooth gaps and shall be equal to $d + dR$ *Min.*

9.1.2 The measurement over pins of wheels with odd numbers of teeth should be carried out over pins with tooth gaps most nearly opposite and shall be equal to $d \cos \dfrac{90^\circ}{z} + dR$ *Min.*

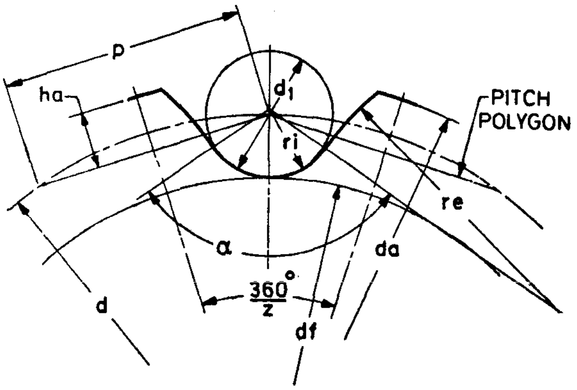
9.1.3 The limits of tolerance for the measurement over pins are identical to those for corresponding root diameters.

9.1.4 The measuring pin diameter shall be equal to bush diameter (*Max*) subject to tolerance limit of $^{+\,0{\cdot}01}_{\;\;0}$ *Min.*

9.2 *Tolerance for Root Diameters* — The tolerance for root diameter ($df = d - d_1$) shall be as given below:

Root Diameter (mm)	*Upper Deviation*	*Lower Deviation*
$df \leqslant 127$	0	0·25 mm
$df \leqslant 250$	0	0·30 mm
$df > 250$	0	*h* 11

10. Wheel Tooth Gap Forms — *See* Fig. 3.



p = chordal pitch and is equal to chain pitch

d = pitch circle diameter

d_1 = bush diameter, maximum

ri = bush seating radius

α = bush seating angle

re = tooth flank radius

ha = height of tooth above pitch polygon

da = tip diameter

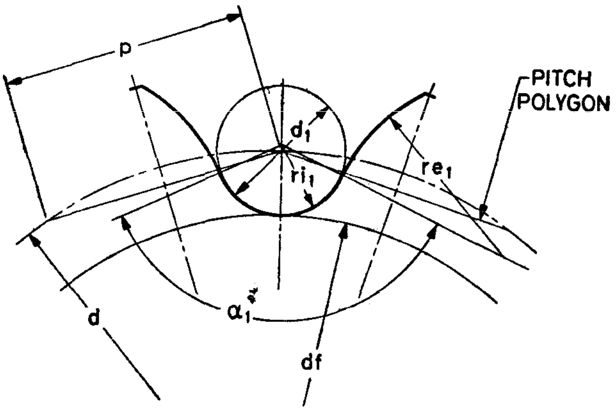
df = root diameter

z = number of tooth

FIG. 3 WHEEL TOOTH GAP FORMS

10.1 The limits of the tooth gap form are determined by the minimum and maximum tooth gap forms. The actual tooth gap form provided by cutting or equivalent method shall have tooth flanks of a form lying between the minimum and maximum flank radii and blending smoothly with the bush seating curve subtending the respective angles.

10.2 The minimum value of tooth gap form shall be as given in Fig. 4.



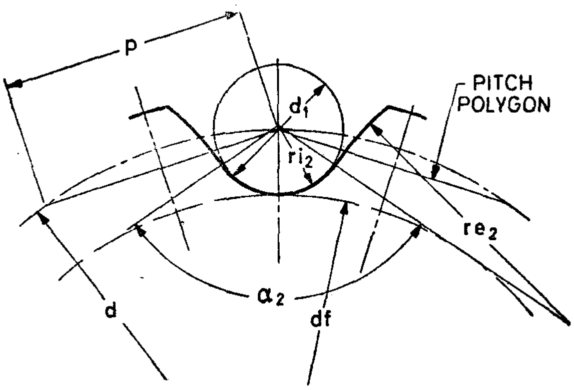
$$ri_1 = 0{\cdot}505\, d_1$$

$$\alpha_1 = 140° - \frac{90°}{z}$$

$$re = 0{\cdot}12\, d_1\,(z + 2)$$

FIG. 4 MINIMUM TOOTH GAP FORM

10.3 The maximum value of the tooth gap forms shall be as given in Fig. 5.



$$ri_2 = (\, 0{\cdot}505\, d_1 + 0{\cdot}069\, \sqrt[3]{d_1}\,)\ \text{mm}$$

$$\alpha_2 = 120° - \frac{90°}{z}$$

$$re_2 = 0{\cdot}008\, d_1\, (\, z^2 + 180\,)$$

FIG. 5 MAXIMUM TOOTH GAP FORM

10.4 *Tooth Heights and Tip Diameters*

10.4.1 The maximum and minimum limits of tooth height above the pitch polygon shall be obtained from the following formulae:

$$ha_{\text{Max}} = 0{\cdot}625\, p - 0{\cdot}5\, d_1 + \frac{0{\cdot}8p}{z}$$

$$ha_{\text{Min}} = 0{\cdot}5\, (\, p - d_1\,)$$

Note — ha_{Max} is related to da_{Max} and ha_{Min} to da_{Min}.

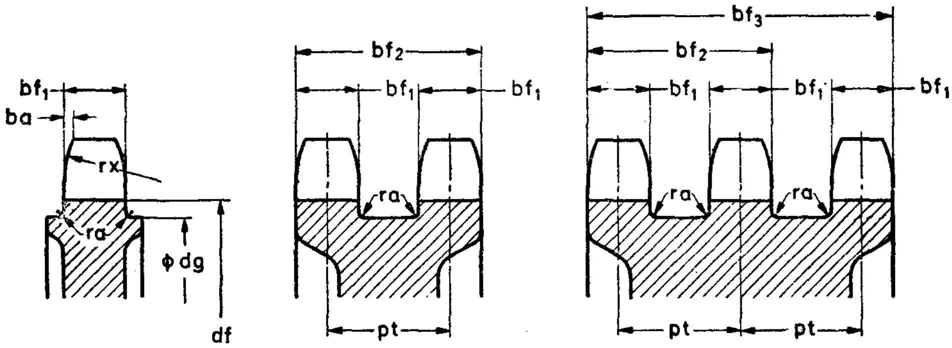
10.4.2 The maximum and minimum limits of tip diameter shall be as follows:

$$da_{\text{Max}} = d + 1{\cdot}25\, p - d_1$$

$$da_{\text{Min}} = d + p\, (\, 1 - \frac{1{\cdot}6}{z}\,) - d_1$$

Note — da_{Min} and da_{Max} can be applied arbitrarily both to the minimum and maximum gap forms, subject to the limitations imposed by the cutter on da_{Max}.

11. Wheel Rim Profiles — *See* Fig. 6.



bf_1 = tooth width

bf_2 and bf_3 = widths over teeth

rx = minimum tooth side radius

ba = tooth side relief

ra = shroud radius

dg = absolute maximum shroud diameter

df = root diameter of wheels

p = chain pitch

pt = transverse pitch of stands

b_1 = width between inner plates, *Min*

h_2 = inner plate depth, *Max*

FIG. 6 WHEEL RIM PROFILES

11.1 The valve of tooth width of simple and multiple chain wheels shall be as given below (*see* Fig. 6):

Dimensions	*Value*	*Tol*
bf_1 = for simple chain wheels	0·93 b_1	h14
bf_1 = for duplex and triplex chain wheels	0·91 b_1	h14
bf_1 = for quadruplex chain wheels and above	0·88 b_1	h14

11.2 The width over teeth bf_2 and bf_3 shall be the value obtained from:

bf_2 and bf_3 = (number of strands − 1) × $pt + bf_1$ (tolerance h14 on bf_1)

11.3 The minimum tooth side radius *rx* shall be equal to chain pitch *p*.

11.4 The tooth side relief *ba* shall have a value from 0·1 *p min* to 0·15 *p max*.

11.5 The value of absolute maximum shroud diameter shall be obtained from the following:

$$dg = p \cot \frac{180^\circ}{z} - 1{\cdot}05\, h_2 - 1{\cdot}00 - 2ra_{\text{act}} \text{ mm}$$

where ra_{act} = actual shroud radius provided

12. Other Requirements

12.1 *Radial Runout* — Radial run-out between the bore and root diameter shall not exceed a value for total indicator reading derived from:

0·000 8 *df* + 0·08 mm, or 0·15 mm, whichever is the greater up to a maximum of 0·76 mm

12.2 *Axial Runout (Wobble)* — Axial run-out, measured with reference to the bore and the flat part of the side face of the teeth, shall not exceed a value for total indicator reading derived from 0·0009 *df* + 0·08 mm subject to a maximum of 1·14 mm.

12.2.1 For fabricated (welded) wheels, 0·25 mm may be accepted if the above formulae give smaller values.

12.3 *Pitch Accuracy of Wheel Teeth* — Shall be as agreed to between the manufacturer and the purchaser.

12.4 *Range of Teeth* — The preferred range of numbers of teeth shall be 17, 19, 21, 23, 25, 38, 57, 76, 95 and 114.

12.5 *Bore Tolerance* — Unless otherwise agreed between the manufacturer and the purchaser, the bores shall have a tolerance value of H8.

12.6 *Pitch Circle Diameter of Chain Wheels* — *See* Appendix A.

13. Marking — Chain wheels shall be marked with the:

a) number of teeth,

b) manufacturer's name or trade-mark (if any), and

c) chain designation.

APPENDIX A

(*Clause* 12.6)

PITCH CIRCLE DIAMETERS

The following table gives correct pitch circle diameters for wheels to suit a chain of unit pitch (for example 1 mm). The pitch circle diameters for wheels to suit a chain of any other pitch are *directly proportional* to the pitch of the chain.

Number of Teeth	Pitch Circle Diameter	Number of Teeth	Pitch Circle Diameter	Number of Teeth	Pitch Circle Diameter	Number of Teeth	Pitch Circle Diameter
9	2·923 8	45	14·335 6	81	25·789 6	117	37·246 7
10	3·236 1	46	14·653 7	82	26·107 8	118	37·565 0
11	3·549 4	47	14·971 7	83	26·426 0	119	37·883 3
12	3·863 7	48	15·289 8	84	26·744 3	120	38·201 6
13	4·178 6	49	15·607 9	85	27·062 5	121	38·519 8
14	4·494 0	50	15·926 0	86	27·380 7	122	38·838 1
15	4·809 7	51	16·244 1	87	27·699 0	123	39·156 4
16	5·125 8	52	16·562 2	88	28·017 2	124	39·474 6
17	5·442 2	53	16·880 3	89	28·335 5	125	39·792 9
18	5·758 8	54	17·198 4	90	28·653 7	126	40·111 2
19	6·075 5	55	17·516 6	91	28·971 9	127	40·429 5
20	6·392 5	56	17·834 7	92	29·290 2	128	40·747 8
21	6·709 5	57	18·152 9	93	29·608 4	129	41·066 0
22	7·026 6	58	18·471 0	94	29·926 7	130	41·384 3
23	7·343 9	59	18·789 2	95	30·244 9	131	41·702 6
24	7·661 3	60	19·107 3	96	30·563 2	132	42·020 9
25	7·978 7	61	19·425 5	97	30·881 5	133	42·339 1
26	8·296 2	62	19·743 7	98	31·199 7	134	42·657 4
27	8·613 8	63	20·061 9	99	31·518 0	135	42·975 7
28	8·931 4	64	20·380 0	100	31·836 2	136	43·294 0
29	9·249 1	65	20·698 2	101	32·154 5	137	43·612 3
30	9·566 8	66	21·016 4	102	32·472 7	138	43·930 6
31	9·884 5	67	21·334 6	103	32·791 0	139	44·248 8
32	10·202 3	68	21·652 8	104	33·109 3	140	44·567 1
33	10·520 1	69	21·971 0	105	33·427 5	141	44·885 4
34	10·838 0	70	22·289 2	106	33·745 8	142	45·203 7
35	11·155 8	71	22·607 4	107	34·064 0	143	45·522 0
36	11·473 7	72	22·925 6	108	34·382 3	144	45·840 3
37	11·791 6	73	23·243 8	109	34·700 6	145	46·158 5
38	12·109 6	74	23·562 0	110	35·018 8	146	46·476 8
39	12·427 5	75	23·880 2	111	35·337 1	147	46·795 1
40	12·745 5	76	24·198 5	112	35·655 4	148	47·113 4
41	13·063 5	77	24·516 7	113	35·973 7	149	47·431 7
42	13·381 5	78	24·834 9	114	36·291 9	150	47·750 0
43	13·699 5	79	25·153 1	115	36·610 2		
44	14·017 6	80	25·471 3	116	36·928 5		

EXPLANATORY NOTE

This specification was first published in 1966. The committee responsible for its preparation reviewed the specification and decided to revise it to be in line with the current international practices.

The dimensions of the chains specified ensure interchangeability of any given size and provide interchangeability of individual links of chains produced by different manufacturers of chains and for repair purposes.

In this revision, dimensions of two most commonly used precision bush chains have been included in Table 1 and also the dimensions of the standard attachments for use with 06 C size chains have been added.

In the preparation of this revision, assistance has been derived from ISO 1395-1977 ' Short pitch transmission precision bush chains and chain wheels', issued by International Organization for Standardization.

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